Workforce Development Strategies:
Information Technology Cluster Report

USAID / Egypt

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1. INTRODUCTION

At the highest levels, Egypt recognizes the need for human capital development in order to increase its competitiveness in the global economy. In a July 1999 meeting with U.S.Vice President Gore, President Mubarak specifically asked for U.S. assistance in human resource development and information technology. As a result of this conversation and analysis already conducted, the USAID / Egypt Mission included a new workforce development strategic objective in its strategy. In response to the Mission's new strategic objective, a team from PricewaterhouseCoopers, SRI International, and J.E. Austin Associates (hereafter referred to as the Workforce Development Strategies (WDS) Team) was selected to operationalize parts of this Mission strategy and conduct the Workforce Development Strategic Planning Process.

Through dialogue with IT stakeholders from September through December of 1999, the WDS Team attempted to present a compelling story of "why" stakeholder action on workforce development was necessary to make the information technology (IT) cluster more competitive. It is important to note that the WDS Team's work built upon previous IT research documents commissioned by USAID and other organizations.[1] As these other reports documented, the WDS Team confirmed that there are considerable policy and infrastructure issues that the Egyptian IT cluster and Egyptian Government will need to address to create an enabling environment for the IT cluster to prosper. These challenges include:

- Liberalization of the telecommunication sector;
- Infrastructure improvements;
- Tax polices; and
- Protection of intellectual property rights.

However, rather than concentrate this Workforce Development Strategic Planning Process on these known constraints, the WDS Team made the assumption that many of these challenges are or will be addressed and resolved. Assuming an enabling environment, the WDS Team then focused on the IT cluster's future strategy for competitiveness and what this strategy implies for workforce development. It is not the WDS Team's intention to diminish the importance or potential difficulty of developing better infrastructure and sound policy that can support IT cluster growth. But, the IT cluster cannot afford to wait until these constraints are lifted to begin planning for its workforce development needs. If it does, it will miss a window of opportunity during the infancy of the worldwide IT revolution.

The content of this cluster report is divided into the following four sections:

- ***Global Trends:*** This section highlights major global IT trends that will affect the development of the Egyptian IT cluster and its workforce. The trends outlined in this section are by no means the only global cluster trends, but instead represent the

[1] These documents include reports by Harvard Consulting, Steve Mintz, and Development Informatics.

"megadrivers" that could have the biggest impact on the Egyptian industry's growth prospects.

- ***Egyptian IT Cluster:*** This section provides a high-level description of the Egyptian IT cluster, and specifically describes a few of the potential high-impact segments relevant to workforce development and competitiveness. This is not an exhaustive cluster competitive analysis. Instead it focuses on describing elements of the cluster most relevant for understanding the workforce development challenges in the cluster.

- ***Workforce Development Implications:*** In light of the global trends and the WDS Team's analysis of the current challenges facing the Egyptian IT cluster, this section identifies many of the key skills gaps and other workforce development issues that must be addressed if the cluster is to be competitive. This section also reviews the supply-side of the workforce equation looking specifically at how and whether the skill development needs are being met by educators and training providers.

- ***Initiatives for Action:*** The final section of the cluster report is a summary of the IT cluster's strategic planning workshop. This section does not represent the WDS Team's recommendations to USAID on what initiatives the donor should support.[2] Instead, this section serves to document the stakeholders' priorities and areas where this process began to generate stakeholder momentum for workforce development. The initiatives highlighted in this section represent actions that the stakeholders designed and, to varying degrees, committed to implement.

Also intertwined in this report (primarily in Section III) is reference to gender specific issues.[3] The purpose of including a gender component in this workforce development cluster strategic planning process is to increase private sector awareness of equity issues while pointing out ways for industries to improve their competitiveness by using all workforce participants as effectively as possible. Like men, women seeking employment in the formal sector often lack the skills required for Egypt to develop a knowledge-based, globally competitive economy. This is sometimes compounded by cultural, legal, and economic factors that limit women's opportunities, earnings, and benefits. Yet women's employment in Egypt is increasingly critical to household income and family well being. Furthermore, some of the social issues identified in this report pertain to the career development of men as well as women.

Cluster Findings and Initiatives

At the First National Information Technology (IT) Conference in Cairo (September 13-14, 1999), President Mubarak outlined his six priorities for the IT industry:

- Create local demand for IT use;
- Pursue international markets;

[2] The WDS Team presented its recommendations to USAID / Egypt in a PowerPoint presentation on 11 / 9 / 99.

[3] Gender issues, for the purposes of this report, refer to systems of culturally constructed roles for men and women and relations between men and women.

- ***Develop human resources;***
- Partner with developed IT countries;
- Invest in IT; and
- Review laws and policies that protect IT developers.

As a result of this speech, and previous requests to U.S. Vice President Gore for help with the development of Egypt's IT industry, this cluster's competitiveness is recognized as a high-priority for Egyptians and USAID. In the context of this task, the WDS Team worked with Egyptian industry stakeholders to understand their key workforce development challenges. The following two challenges emerged as crucial to the cluster:

- ***Rapid introduction of new skills***

There is an acute shortage of software developers, program designers, network engineers, and project managers in the country. For example, there are only 777 graduates per year in computer science, as compared to an industry need of some 5,000 new software developers per year.

- ***Retention***

As a result of the skills shortage, those individuals that possess marketable skills are in high-demand and the industry finds retention difficult. But what is also disturbing is not only that employees leave their Egyptian IT jobs, but that many are leaving for other countries. Thus the phenomenon of "brain drain" appears a major threat to the growing IT cluster.

On December 7, 1999, thirty-one IT cluster stakeholders came together at a Strategic Planning Workshop to outline initiatives that would begin to address this extensive challenge. Many initiatives were specific to industry's internal human resource management, and some centered around increasing the relevance of training providers and educators' curriculum and teaching methods. A third set of initiatives focused on improving the linkages between demand (industry) and supply (educators/training providers). The stakeholders selected the following three initiatives to undertake:[4]

Initiative 1: Education / Industry Linkage Program

Under this initiative, the IT industry will dialogue with the IT faculties and training institutes to articulate their training needs on regular basis. Building on the initial success of a partnership committee between the electronics industry and a group of Egyptian universities and institutes, the initiative would aim to extend that concept to other segments of the IT cluster. These planning committees would undertake such tasks as developing industry / education partnership case studies and conduct demand assessments that would be disseminated throughout the cluster as well as to educators and training providers. Below is a summary of the action plan designed by stakeholders for this initiative:

[4] These initiatives are detailed in full action plans in Section 4 of this report.

- ***Step 1:*** During kick-off meeting at Mentor Graphics, develop a "road map" for achieving the results, determine which industry segments should be included in the initiative action plan, and establish sub-committees from industry and university for each segment. (*January 24, 2000)*
- ***Step 2:*** Prepare a case study on the electronics industry-university partnership. Disseminate the case study so that it can serve as a model of success. *(March 2000)*
- ***Step 3:*** Extend electronics model to other segments of the IT industry including software development. *(April 2000)*
- ***Step 4:*** Sub-committees will review industry workforce / education needs in its respective segments of the industry. Following the needs assessment, industry would consult with faculties and institutes about updates of the curriculum oriented towards meeting current skills gaps. *(June 2000)*
- ***Step 5:*** Faculty and instructors will modify programs to reflect current needs. *(September 2000)*
- ***Step 6:*** Review and monitor program, and make continuous adjustments in light of current needs *(ongoing annually).*

Initiative 2: Strengthen Internal HR Systems

The proposed initiative will begin to develop model HRM systems within select IT firms by building a senior executive leadership program to raise awareness of HR development strategies, developing "best practice models" to cover such issues as workplace turnover, investments in training, and company budget allocations for training. Below is a summary of the action plan designed by stakeholders for this initiative:

- ***Step 1:*** The Egyptian Human Resources Management Association (EHRMA), the Management Development Initiative (MDI), GMT, and the International Executive Service Corps (IESC) will develop a senior executive leadership program to develop awareness of HR development strategies. *(February 2000)*
- ***Step 2:*** A HR systems seminar coordinated by GMT. *(March 2000)*
- ***Step 3:*** Develop a model HR systems appropriate to the IT companies in Egypt. *(Nine IT companies by July 2000)*
- ***Step 4:*** The new model HR systems will be shared and networked by Yasser Elmamoudy (Citibank) and by Amany Meomen (High Tech Systems). *(July 2000)*

Initiative 3: Association Workforce Development Services

This initiative will enhance the role of associations in responding to the training / human resource management (HRM) needs of the sector. A joint association HR committee will create a clearinghouse to gather and disseminate information on such issues as cluster training needs, HR management expertise, survey results, market trends, training providers, specialized skills, and service providers. Below is a summary of the action plan designed by stakeholders for this initiative:

- ***Step 1:*** The champions will meet to finalize objectives and work plan of the initiative. *(January 2000)*
- ***Step 2:*** Four associations ESA, EHITA, ECA, and the EIS from the industry will form a joint HR development committee. *(February 15, 2000)*

- ***Step 3:*** Create an on-line discussion group on human resource development. *(February 15, 2000)*
- ***Step 4:*** Create a clearinghouse to gather and disseminate information on: cluster training needs, HR management expertise, survey results, market trends, training providers, and specialized skills and service providers. *(August 2000)*

Next Steps

This phase of the Workforce Development Strategic Planning Process created stakeholder awareness and dialogue on potential solutions to workforce development challenges. However, the true test will be whether and how stakeholders will be able to capitalize on the present momentum to ensure that solutions materialize into real, dynamic change. The WDS Team looks forward to working with the cluster's stakeholders over the coming months to assist in the implementation of these workforce development strategies with the ultimate goal of greater cluster competitiveness.

2. GLOBAL TRENDS

Information technology, and today specifically the Internet, is changing the manner in which all industries operate. From desktop publishing and office automation to multimedia and e-commerce, the IT industry is the engine to transform business. On-line transactions have been one way for companies to expand their business across borders. Companies can conduct business 24 hours a day, anywhere in the world.

Multinational companies allocate considerable R&D resources to e-commerce development and, once the Internet becomes available and affordable in developing countries, it could open up doors for their suppliers and retailers. Global manufacturing networks from all over the world supply corporations, small and medium-size business, manufacturers, financial institutions, government agencies and PC users everywhere with the latest IT has to offer.

Figure 1. World Market For IT Services

IT Services Export Industry (1998)

- Software Development: $141 billion
- Information Processing: $ 43 billion
- Computer Aided Design: $ 44 billion
- Data Entry $ 1 billion
- **TOTAL: $230 billion**

Projected Growth in Export Segments:
15 - 20% per year

LDC Informatics Exports:
$33 billion

Open World Inc, 1998.

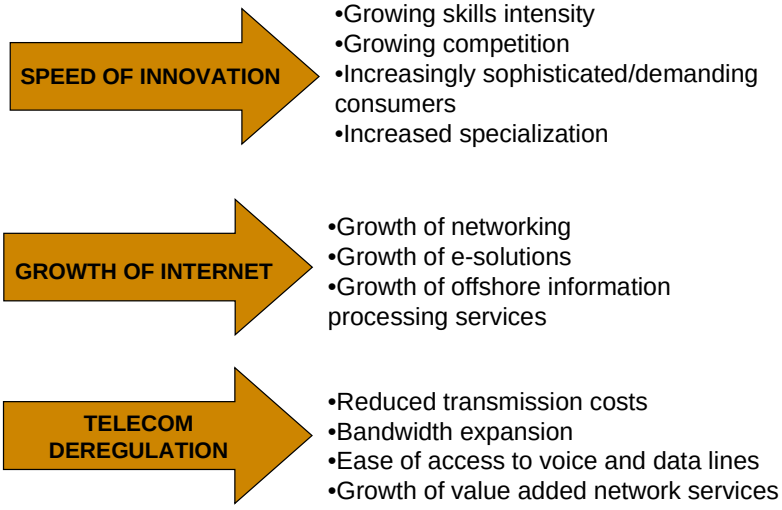
As *Figure 1* indicates, the world market for IT service exports is large ($230 billion in 1998) with offshore software development services offering the biggest market segment, followed by information processing and computer aided design (CAD). Data entry represents the most labor-intensive segment of the IT export market, but its share of total IT export earnings is relatively modest. In addition, as scanning techniques become more sophisticated, the growth prospects for offshore data entry functions will be limited.

The projected growth of these IT export services is rapid, at 15 to 20 percent per annum over the next five years. Less developed countries currently export US $33 billion dollars of IT services, or about 15 percent of the total export market. But their share has risen, from 10 percent of total IT exports in 1995.

Megadrivers

As Egypt attempts to find its niche in this global IT market, three key megadrivers will greatly influence how Egypt defines this strategy.

Figure 2. Megadrivers



- ***Speed of Innovation***
  Continual, fast-moving change defines the IT revolution. New companies are quickly designing new products. This megadriver creates a very competitive and specialized environment. Consumers also have become increasingly sophisticated and demanding. To meet these consumer' demands requires an IT industry with the depth of skills that allow workers to retool and innovate quickly.

- ***Growth of Internet Technology***
  The rise of the Internet has changed how any IT industry looks and competes. Through its wide and fast reach, the Internet requires and provides certain services to individuals and businesses. For example, as a result of Internet expansion, there is also a growth of networking, and a rise in demand for e-solutions. Internet technology has also allowed firms to reach beyond their borders and outsource parts of their processes. This in turn creates new IT opportunities for developing countries to develop niche markets. For example, both India and Ireland have

Figure 3. Anatomy of a Cluster: Bangalore, India

- **Cluster Origins: 1985**
  - Texas Instruments located a design center in Bangalore
- **Indian Government Initiatives**
  - Investment in education, infrastructure (software tech. parks)
  - Tax incentives
- **Anatomy of Cluster Today:**
  - Over 40,000 software professionals
  - Employed in 200 companies (68 multinationals)
  - Over $2 billion in revenue (1998)
    - Revenue expected at $4 billion by 2001;
    - Growing at over 60% per year
  - Software exports: Over $350 million
  - Accounting for 53% of all exports
  - 140 of Fortune 500 outsourcing software requirements to Indian companies
- **Educator & Training Provider Linkages**
  - Example: IIT

created distinct and successful IT clusters providing offshore services to multinational companies. *(See Figures 3 for summary of the Bangalore, India cluster.)*

- ***Telecommunication Deregulation***
  The growth of the Internet is also a function of a more sophisticated and deregulated telecommunication industry. Customers have experienced reduced transmission costs while gaining wider bandwidth, ease of access to voice and data lines, and an overall growth of value-added network services.

  Although not classified as megadrivers by the WDS Team, there are two other important trends that greatly influence the IT industry in the United States, and that over time may influence countries such as Egypt:

  Accessibility: In the U.S. over a relatively short time period, the cost of hardware, software and access to Internet has been significantly reduced, making IT a more available asset for individual users and businesses.

  Venture capital: Innovation requires capital. Due to the high level of exposure IT receives, venture capitalists are willing to invest in fledgling new start-up firms, new products, and new services within this cluster. Although there is some economic debate over whether these firms are overvalued, presently in the U.S. the capital to support an innovative IT product tends to be more available than would be for equally untested products in another industry.

3. EGYPTIAN CLUSTER

The Egyptian IT cluster is growing rapidly from a small base. There are presently approximately 400 companies[5] in the cluster, with the largest number of firms being formed in telecommunication equipment, data processing, computer programming, and data processing areas. The IT cluster in Egypt had an estimated total sales revenue of US$300 million in 1998.[6]

Figure 4. Egyptian IT Cluster

400 + private companies

• Computer Programming:	32
• Systems Development / Networking:	9
• Data Processing:	25 - 50
• IT Consulting:	12
• IT Maintenance and Repairs:	152
• Telecommunication Equipment:	100 - 150
• Web Page Developers:	7
• ISP:	50

Kompas, 1998-1999

The IT industry associations and companies project that the IT cluster will grow at about 15 to 20 percent per year over the next five years, consistent with recent growth performance and underlying global market trends for the IT industry. This growth will create a significant expansion in cluster employment. Presently, employment in the Egyptian IT cluster is characterized by small companies. Only 10 to 15 percent of the companies in the sector employ more than 15 people. In total there are approximately 4,000 to 5,000 software developers in Egypt, and 1,000 trainers / IT consulting employees in the sector. The Egyptian IT industry leaders forecast that they will need approximately 4,000 new software developers each year over the next five years in order to maintain current levels of growth.

Export revenues represent approximately US $25 million, including about $US 20 million in the Arabization market for the Middle East[7] and about US $5 million in offshore programming revenues to the United States. There is also a presence in the local market from multinational companies such as IBM, Microsoft, Oracle, and Motorola. It is

5 The WDS Team gathered a majority of the statistics presented in Section 2 from interviews with IT cluster stakeholder interviews. The WDS Team found that there is a significant dearth of reliable IT cluster data sources. In cases where printed data on a topic was available, much of it contradicted other information sources. As the cluster discussed in the Strategic Workshop, this lack of quality data will make it extremely difficult for the cluster to plan strategically when the stakeholders are unsure of exactly what the cluster is undertaking today. One of the key initiatives the stakeholders elected to undertake looks at how the cluster can collect and disseminate more accurate data.

6 It is estimated that the telecommunication sector makes up at least half of this revenue figure. For the remainder of the report, however, the WDS Team does not focus on the telecommunication portion of the IT cluster.

7 Egyptian IT companies in Egypt export 50% of the “Arabized” software products currently in use in the Middle East.

estimated that these multinational companies represent about 70 percent of the total IT sales revenues in Egypt.

Developing the Local Market

Local market user expenditures on IT presently run approximately US $20 to 30 million per year. The major users of IT include banking/ finance, telecommunication, utilities, oil, hospitality/ tourism, government, and multimedia companies. Based on the WDS Team's interviews with many of these companies, IT represents 20 to 35 percent of their operating budgets, with expenditures growing at 15 to 25 percent per annum. A large portion of the IT expenditures is dominated by local and international telecommunication service charges, new hardware / PC charges, and by customized business software solutions.

Many of these local market companies outsource a large proportion of their IT spending, but a majority outsource to multinational companies. When asked why they selected multinational firms, local IT users identified four major criteria they look for when making an IT purchase or outsourcing decision:

- Reputation (brand name);
- Capacity to mobilize required resources;
- Reliability, timeliness and quality; and
- Reliable maintenance and support.

Although some major local companies did actively use Egyptian IT firms, many said that the present Egyptian firms did not meet all of the criteria listed above. However, increasingly multinational firms are outsourcing some parts of these local business opportunities to Egyptian IT firms.

In addition to large firms and industries utilizing IT, there are also other themes that have and will continue to drive and increase local IT demand:

- ***Internet***
  Exponential growth in user accounts makes people aware of the power of IT. Many of the small Egyptian software companies will be able to compete with multinational and imported Internet related products and services on the basis of lower labor rates, and ability to tailor the product to local needs and business practices. Although e-commerce does not have a real presence in the local market, companies are beginning to react to global demands for more Internet-based services and products.

- ***Demand***
  Small and medium-size businesses in Egypt are realizing the need for IT to compete in a global environment. Many Egyptian companies are becoming aware that affordable systems that will help them automate their businesses.

- ***Education***
  Educated people are learning the benefits and necessity of IT. In today's job market place, computer knowledge is a prerequisite in any given industry.

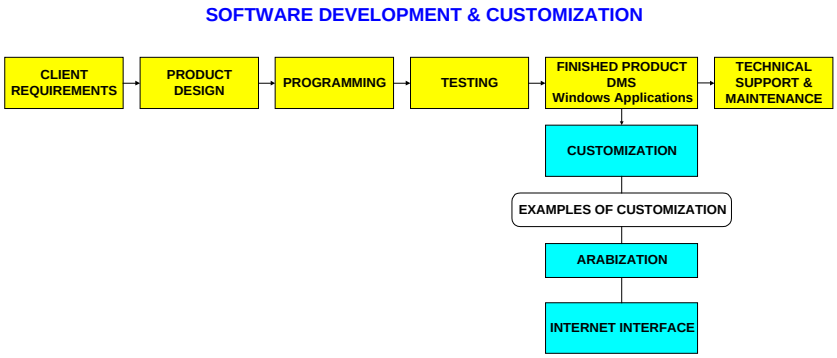
Developing Focused Market Niches

Today, the Egyptian IT cluster is relatively small and focused on a narrow segment of the software customization market, Arabization. Sustained growth of the cluster will require expanding into other market segments. Two potential expansion segments could include 1) software development and customization and 2) offshore information services. Both segments build on the reputation and expertise developed through the Arabization work. How would growth be achieved in these segments? What skills would be required to succeed in these segments?

Software Development and Customization

As previously discussed, the Egypt IT cluster has a firm market niche in software Arabization. However, this market is only a small part of software customization opportunities. As illustrated in *Figure 4* other possible customization opportunities, such as Internet interface, are also based on finished software. But discussions with cluster firms confirmed the lack of many of the skills required to expand into other software development areas. These skills include product design, computer programming in various high level languages, testing, technical support, and becoming value-added resellers (VARs) of key software programs. Although not unique to this segment, the ability to develop and manage client expectations and relationships is also key. As local and regional demand for IT systems expand, companies will want the ability to augment software to their specific needs. Gaining these needed skill sets could open up the local market more to Egyptian firms.

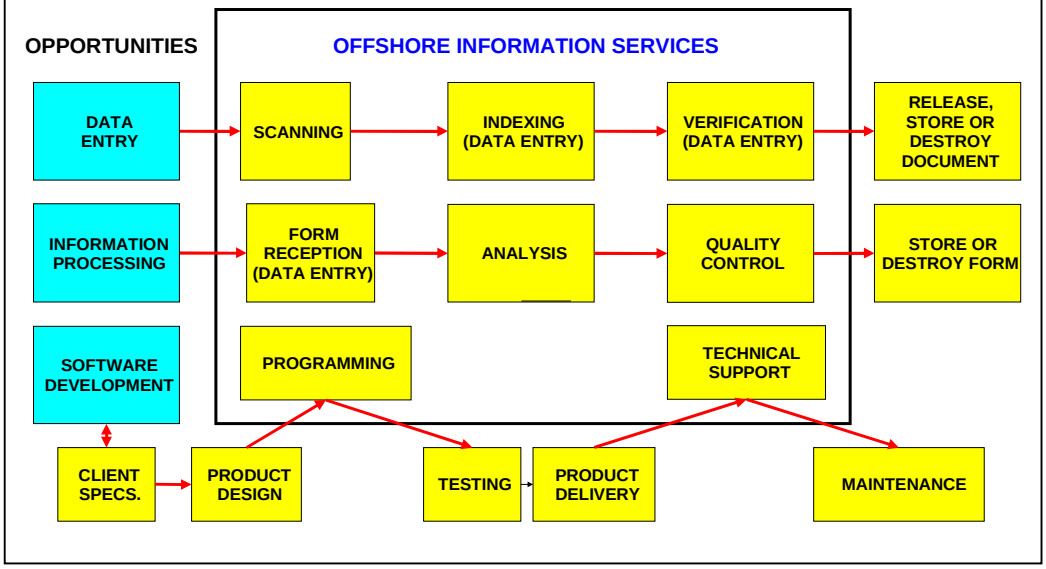
Figure 4. Software Development & Customization Supply Chain



Offshore Information Services

Information technology has made time more elastic. With the ability to communicate across time zones, businesses are operating 24 hours across the globe through the use of offshore services. The segment of offshore information services offers Egypt opportunities in a variety of areas such data entry, information processing, CAD, and other programming

Figure 5. Offshore Information Services Supply Chain



opportunities. Where data entry, as the least skill intensive service, may offer Egypt an entry into the offshore market, its long-term growth is limited as scanning equipment becomes more sophisticated. As a result, the Egypt IT cluster could position itself to expand to provide complimentary offshore services such as information processing and software development. These services require such skill sets as data verification, data analysis, quality control, programming, and technical support. The key skill that any firm looking to outsource part of its product or service will require is a mastery of English, as this is the base language for all software.[8]

Cluster Focus

As successful developing country IT clusters have demonstrated, gaining entry into any market niche requires a strategic focus and a cluster working together. With IT so quickly evolving, experiences in other countries support that success will require that firms avoid attempting to be all things to all people. Instead players may be better off looking for possible niches and develop the flexibility to retool workers as the segment changes. As local companies look to Egyptian firms for their IT needs, or multinational companies look to place part of the business process offshore, they will consider numerous types of risk including:

[8] India and Ireland have a language advantage over Egypt. English is the national language of Ireland, and as a former British colony, English is also pervasive in India among high school and university educated.

- ***People Risk:*** How reliable are the management and employees in performing the needed tasks? Are they qualified?
- ***Financial Risk:*** Is this investment going to be profitable? Does it provide overall value to my product, service, and / or organization?
- ***Technology Risk:*** Does this firm have access to constantly changing cutting edge technology?

Regardless of which segment the Egyptian IT cluster pursues, gaining customers requires the cluster to work together to cultivate the correct skill sets to be competitive.

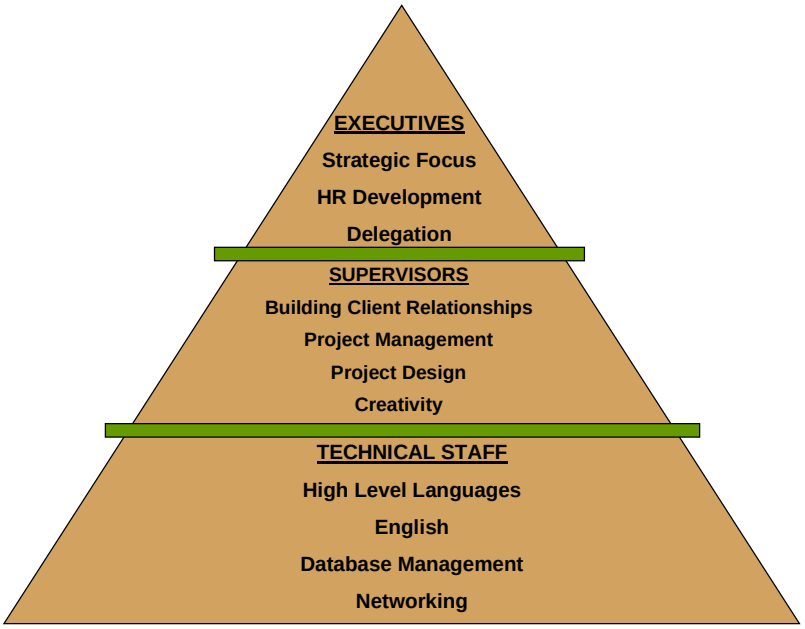
4. WORKFORCE DEVELOPMENT IMPLICATIONS

Through discussions with the cluster stakeholders, the WDS Team identified and prioritized workforce development challenges facing the cluster. Foremost on the list is filling the critical skills gaps identified by stakeholders.

Skills Gaps

Functional and critical core skills gaps varied depending upon the level of the employee. *Figure 6* describes what Egyptian cluster stakeholders felt were the biggest gaps (both functional and core) at diverse levels within the industry:

Figure 6. Skills Gaps



Executives

IT is a dynamic and fast moving industry, it requires leaders with a strategic vision for the business to anticipate change and exploit opportunities. In a nascent IT market like Egypt, it means that firms need to be willing to take a very proactive approach to develop marketing strategies. However, many of the Egyptian IT companies interviewed did not have a marketing department. Stakeholders acknowledge they lack the time and resources to develop a clear industry understanding of global trends and their affect on the growth of the Egyptian IT cluster.

Fast growth is also placing a time burden on managers; however, similar to other clusters, the WDS Team found that in numerous IT firms, a few top people made all of the decisions regardless of the size or importance of the decision. Therefore, delegation was seen to most stakeholders as another skill gap that must be included in this top level. Finally, in such a fast growing industry, there is need for leadership on human resource management to ensure that an IT business can recruit, train, and retain the cadre of workers needed to make the business a success.

Middle Management / Supervisors

As a cluster, there is no clearly identifiable group that manages people / ideas between the upper levels of companies and the technical personnel level. This creates a gap in communication both within a firm and with a client. There is a strong need for project managers with skills in proposal development, project scheduling of activities, supervision of teams, and customer liaison. The project manager should possess a working knowledge of the IT industry in general in order to employ the best possible technology available for each product or service provided. This knowledge could include product cycle, such as specifications, product design, coding, testing, quality control and maintenance as well as methodologies.

Creativity is also an important IT skill or talent which Egyptian cluster stakeholders felt needs further development in Egypt. Many stakeholders at the workshop stated that the Egyptian educational system relies too much on rote learning from lecture format with little critical thinking or creativity required of the students. Stakeholders believe this learning approach handicaps Egyptian software producers when they are asked to create original value added products for their customers.

Technical Staff

At the technical staff level, the demand is for high-level languages. For example, for Internet-based technologies, technical people should know HTML, Java and TCP IP in a Windows NT, Windows 98 or Unix environment. In software development, Visual Basic and Visual C++, as well as databases such as Oracle or Sequel server using methodology and case tools. Learning these computer languages also requires a critical core skills – oral and written English. In addition to high-level languages, stakeholders included other functional skills such as database management and networking.

Figure 7. Functional Skills

Computer Programming	Network Engineering	Technical Support
•Translate business processes into pseudocode •Programming languages (e.g.. HTML, Java, Visual Basic, C++) •Design, create, compile, run programs •Client server architecture •Structured Query Language (SQL) •Database development •Web-page development •Encryption techniques •Translation: English to Arabic •Data entry •Testing & debug •Technical writing/documentation	**•Install, configure, administer MS Windows NT** **• TCP/IP Protocols suite** **•Troubleshoot techniques** **•Design & build web pages using HTML** **•Repair computer hardware** **•Set up, integrate mixed Novell & NT Network**	**•Install, configure, troubleshoot DOS & Windows suite** **•Knowledge of Internet communication programs** **•Customer service techniques** **•Knowledge of support center databases**

The required functional skills will vary depending upon the type of technical worker needed. (*See Figure 7.*) IT is highly skills intensive. Given the broad range of languages and technical skills required, it makes sense for firms to specialize and structure around a few core skills sets that they can constantly update.

However, regardless of specialization, critical core skills are needed across all market segments and levels of a firm. These critical core skills include:

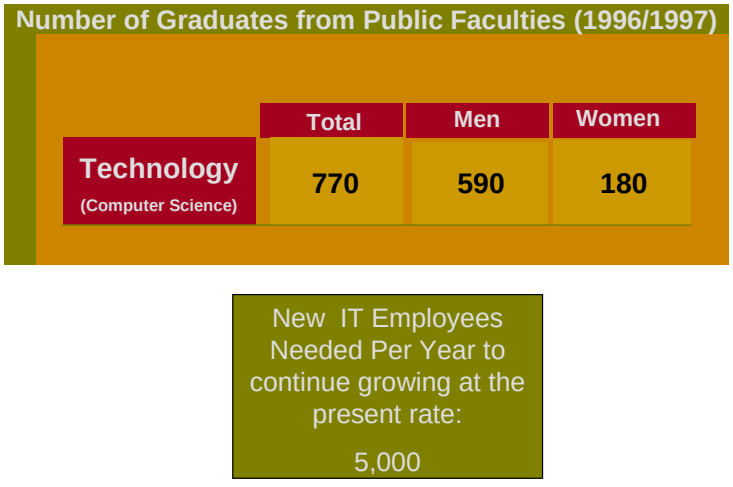
- English: literacy, numeracy, keyboarding
- Basic computer skills: word processing, spreadsheets
- Oral & written communication
- Information gathering & analysis
- Delegation
- Teamwork
- Problem solving
- Detail orientation
- Market trend analysis
- Marketing
- Business development
- Project management
- Decision making
- Strategic planning

With both functional and critical skill needs, the key workforce development question is how will Egypt rapidly introduce these skills sets into the present and future workforce in order to capitalize on the IT revolution? This was the challenge posed to the stakeholders at the strategic workshop.

Educators & Training Providers

While it is estimated that the industry will need an additional 4,000 new IT employees per year to continue growing at the present rate, in 1997 the public faculties graduated only 770 new computer science graduates. (*See Figure 8.)*

Figure 8. Faculty Graduates



CAPMAS, The Statistical Yearbook 1992-1998, June 1999

A majority of these graduates have cutting edge computer science degrees, including everything from basic business organization to programming and networking. Increasingly, professors are using innovative teaching methods, such as case studies and group projects that provide

graduates with hand-on learning they can apply when in the workplace. But the number of graduates with these deep computer skills is far less than what the industry is demanding. Even if the computer science departments had the capacity and infrastructure to recruit twice the number of students per year, over the next several years the industry would still have a deficit of qualified workers.

Not all qualified IT cluster employees need to come from a four year computer science program. Today the Egyptian IT cluster is successfully hiring students with other science and even liberal arts degrees to fill openings. According to stakeholders, some of these students take additional computer courses from new cutting edge short programs such as ITI or RITSEC. Many are hired because they possess solid critical skills and employers feel they can train them to learn the functional skills.

Alternative Training Solutions

In other countries, two-year associate degrees provide all of the technical knowledge to enter a firm, but cut back on some of the theory. Often technical background is all that is needed to succeed in this fast paced business. Another option is to have potential workers become "experts" in one or two computer languages. These can be learned through three to four-month courses in appropriate training institutes. *(See Figure 9 for U.S. examples.)* Some very successful programs of this type are emerging in Egypt. For example, numerous faculties and training centers are offering certification programs for Microsoft, Oracle, and Texas Instruments products. A few institutes are offering post-graduate programs (such as ITI), short courses (such as RITSEC), and even the beginning of distance learning. Presently, these programs only graduate at most several hundred candidates per year, far fewer than the industry demands. Keeping up with the skills demands in this high growth cluster is going to require fast development and more new models for updating IT skills. Implementing these types of solutions will require more intensive dialogue between the IT industry and educators / training providers.

Figure 9. Potential Alternative Programs

Computer Learning Centers
3 to 6 month certificate program

Pre-Requisites: Some secondary school
Choose 1 Specialization:

Computer Programming
- 2 Languages per one session
  - C++, HTML, JAVA, Visual Basic
  - Relational Database design (Oracle)
  - SQL

Information Technology Support
- Install, configure and troubleshoot DOS and Windows suite
- Support users of the Microsoft Office Suite

Network Engineering
(1 Certification per Session)
- Microsoft Certified Systems Engineer (MCSE)
- Certified Novell Administrators (CNA)

Montgomery Community College
2 Year Associate Degree

Pre-Requisites: Secondary school or equivalent

Example Curriculum of Computer Science Major
- Introduction to Computer Science
- Computer Concepts
- Basic Programming
- Systems Analysis and Design
- Discrete Structures
- Assembly Language Programming
- Computer Security
- JAVA Programming
- Visual Basic
- UNIX Operating System
- FORTRAN
- Object-Oriented Programming with C++
- C++ Applications Development
- Oracle Programming

At this time, there is little dialogue between industry and educators / training providers. Educators told the WDS Team they do not receive any feedback from industry on if the present programs are producing qualified candidates, and many in industry say they didn't even know many of these programs or centers existed. As presented in Section 4 of this report, many of the potential workforce development initiatives that stakeholders would like to pursue attempt to address this linkage issue.

Internal Human Resource Systems

Workforce development is far more than training. As Egyptian stakeholders stressed to the WDS Team, recruitment and retention are serious worries for IT firms. Finding a solution to these complex HRM issues require private firms to invest in their people. This investment might include putting in place a well-laid out internal human resource department. Through this department, managers could undertake workforce assessments that correctly identify the type of individuals and skill sets the company needs. A HR department could help managers formulate recruitment policies and retention incentives that encourage employees to build their careers with the firm. Other workforce development initiatives include writing job descriptions that articulate the company's expectations for each employee, and designing performance assessments and promotions / incentives linked to that performance.

Career Paths

Most important in a cluster plagued by high-turnover will be the ability for the cluster to offer qualified workers a career home that defines career paths that encourage workers to stay in the firm and the cluster. Many companies do not want to invest in training and development unless they can be sure that they can recover the cost of training with returns within their firm. Loans for training which are forgiven if the employee stays at the firm are one way to recover this cost. Scholarships, access to computers and on-line services, as well as management training are good options. What is key is that the employee sees an opportunity to use these new skills after the training, thus they see a professional reason to stay with the firm.

Many of the companies interviewed had no formal job descriptions for their employees or mission / strategy statements for the working units and divisions. Proper structuring and prioritization of needs, the creation of middle managers and the willingness of high-level managers to delegate must be created. This top down, vertical management style is often not compatible with IT workforce development needs, primarily because it stifles creativity and provides few rewards or incentives for employees to contribute ideas.

Utilizing All Human Resources

In a field where recruitment and retention is already difficult, it is critical that the IT cluster look to the entire labor pool as potential assets. The WDS Team looked at the recruitment and promotion patterns of women in the IT cluster. Women are already a part of this new industry making up approximately 20 percent of the IT labor force, which is close to the proportion of female computer science graduates (23 percent). *(See Figure 10.)* However,

women serve in fewer senior positions, mostly as marketing and sales managers, translators in the Arabization segment, and occasionally owners.

Figure 10. Gender Breakdown

Company Interveiws	Number of Employees	Managerial		Supervisory		Technical		Support Staff	
		Men	Women	Men	Women	Men	Women	Men	Women
9 Key IT Companies	918	64	3	73	40	328	158	143	109

As the industry anticipates growth and the need to fill new positions, it should consider how it to actively encourage a flexible work environment that encourages both men and women's participation. Extending such possibilities as telecommuting or part-time work to both men and women employees helps employers to retain good and loyal workers, while offering flexibility to balance family responsibilities as well. A further benefit to using home-based workers is that overhead costs can be kept down. Finally, women workers are reportedly less likely to seek opportunities abroad than men, thus making sense for IT firms to hire women who will be less likely to contribute to Egypt's "brain drain."

At the end of the day, whether men or women, firms will lose employees. However, the goal of any well integrated cluster, is not so much that those qualified, now well trained employees, will go to another Egyptian firm, but they will be recruited out of the Egyptian cluster altogether. For example, accurate information sharing within a company, as well as between companies in the IT cluster, will be essential in such activities as creating employee skill standards. While each company will have its own trade secrets and knowledge management style, sharing across the cluster in such forums as trade associations, trade shows, and educational forums will benefit IT workforce development by creating an environment where employees want to remain and build careers. All of these actions will ultimately lead to the greater competitiveness of the entire Egyptian IT cluster.

5. PRIORITIES FOR WORKFORCE DEVELOPMENT & COMPETITIVENESS

On December 7, 1999, stakeholders from the Egyptian Information Technology (IT) industry gathered at Le Meridien Hotel in Cairo, Egypt to be part of the IT Cluster Strategic Planning Workshop. The goal of the workshop was "to understand, design, and commit to workforce development initiatives that could build and sustain the competitiveness of the Egyptian IT industry."

After a discussion of the present state of the IT industry, the stakeholders (representing business leaders, educators, training providers, and government officials) created a list of potential initiatives that the stakeholders could undertake to address present and future workforce development needs. Next, the stakeholders refined these initiatives in smaller focus groups. Each group of ideas is presented below.

Potential Initiatives

During a strategic planning workshop brainstorming session, the participants developed the following list as potential actions / initiatives they could undertake to address some of their workforce development challenges:

Strengthen Role of Associations in Workforce Development

- Gather, collect, disseminate information on "market trends, training needs, salary surveys" to guide industry HR policy
- Establish linkages with international associations to explore expansion of services and funding mechanisms
- Establish clearing house for job applicants
- Develop forum for inter-company dialogue to address industry priorities and problems (lobbying organization)
- Improve outreach, market research to end IT users to understand their needs, develop new products, boost demand, and improve responsiveness
- Expand concept of winning "triangle" consortia to work on specific issues
- Popularize IT education at the pre-university level (e.g. summer camps)
- Create on-line industry discussion group
- Support programs to encourage women involvement in IT workforce
- Support for telecommuting
- Clearinghouse of qualified IT specialists
- Providing internet resources
- Introduce systems of part time employment
- Develop commonly shared standards for professionals and certification processes
- Include code of ethics for individuals and business with regard to employment contracts and IPR
- Introduce program of industry sponsored prizes for innovation and product excellence
- Work / lobby towards educational reform

Strengthen Human Resource Management Systems at the Firm Level

- Build business-to-business linkages so as to outsource functions more effectively
- Strengthen recruitment by visiting students in 1 & 2 years and internships in 3rd & 4th years, giving seminars on the industry, career opportunities
- Develop HRM models and policies regarding recruitment, compensation
- Develop formal industry-university feedback mechanisms to evaluate graduates and the schools. Examples might include: written assessments of graduates, surveys

Strengthen Education / Trainer Provider Responsiveness to Industry Needs

- Strengthen education and training institutions (train the trainers)
- Undertake study tour to US to look at alternative training solutions (e.g. cooperative education)
- Encourage support and development of alumni associations to promote university-industry feedback and linkages
- Promote Industry funded research and development in universities and institutes

Planned Initiatives

From the list of potential initiatives, the IT cluster stakeholders developed three initiatives into more detailed action plans. The pages that follow describe these three initiatives in greater detail.

Initiative I:

Education-Industry Linkage Program

Initiative Mission:

Create a closer link between the IT industry and Egyptian education / training providers in order to provide students / workers with the correct set of skills to compete in the industry.

Initiative Overview:

IT educators and training providers are often not able to provide students with the up-to-date knowledge and skill base that is relevant to the current needs of the industry. The initiative would consist of an industry / education provider partnership. Under the initiative, the IT industry would open up a dialogue with the IT faculties and training institutes to articulate their training needs on regular basis. Faculty will update their curricula to respond to the articulated needs. Building on the initial success of a partnership program between the electronics industry and a group of Egyptian universities and institutes, the initiative would aim to extend that concept to other segments of the IT industry.

Initiative Action Plan:

Step 1: Meet during January at Mentor Graphics. At this meeting, the working committee will develop an action plan that will include objectives, performance indicators, and means of measuring performance, and a "road map" for achieving the results. The committee will determine which industry segments should be included in the initiative action plan. The meeting will also establish sub-committees from industry and university for each segment of the industry to be covered. (*January 24, 2000)*
Step 2: Prepare a case study on the electronics industry-university partnership. Disseminate the case study so that it can serve as a model of success *(March 2000)*
Step 3: Extend electronics model to other segments of the IT industry including software development. *(April 2000)*
Step 4: Sub-committees will review industry workforce / education needs in its respective segments of the industry. Following the needs assessment, industry would consult with faculties and institutes about updates of the curriculum oriented towards meeting current skills gaps. *(June 2000)*
Step 5: Faculty and instructors will modify programs to reflect current needs. *(September 2000)*
Step 6: Review and monitor program, and make continuous adjustments in light of current needs (ongoing annually).

Initiative Champions:

Linkage Committee members include: Dr. Nabil Said (ITI), Dr. Hazem Tahawy, Prof. Abdel Moneim Wahdan (Ain Shams University), Dr. Hatem M. El Borai (Zagazig), Dr. Sayed M. Metwalli (Cairo University), Agharid Amin (Microtech), Dr. Mohamed Ismail Youssef (Team Misr), Dr. Hoda Hosny (AUC), Mohy Gamaledin (Microtech)

Initiative II:

Strengthening of Internal HR Systems

Initiative Mission:

Establish / upgrade human resource systems in the Egyptian IT cluster companies in order to enhance employee productivity, loyalty, and career development.

Initiative Overview:

The proposed initiative will strengthen the internal HR systems of IT cluster companies. The program will develop work environments that will: enhance skills; encourage human resource development, and provide greater access to training solutions. The initiative will broaden the HR mission within the companies beyond the payroll / administrative function. The Egyptian Human Resources Management Association (EHRMA) will develop "best practice models" to deal with issues such as: workplace turnover, investments in training, and company budget allocations for training.

Initiative Action Plan:

Step 1: The Egyptian Human Resources Management Association (EHRMA), the Management Development Initiative (MDI), GMT, and the International Executive Service Corps (IESC) will develop a senior executive leadership program to develop awareness of HR development strategies. *(February 2000)*

Step 2: A HR systems seminar coordinated by GMT. *(March 2000)*

Step 3: The initiative will develop model HR systems appropriate to the IT companies in Egypt. *(Nine IT companies by July 2000)*

Step 4: The new model HR systems will be shared and networked by Yasser Elmamoudy (Citibank) and by Amany Meomen (High Tech Systems). *(July 2000)*

Initiative Champions:

Institutions: The Egyptian Human Resources Management Association (EHRMA), and the Management Development Initiative (MDI), GMT, and the International Executive Service Corps,

Individuals: Yasser Elmamoudy (Citibank) and by Amany Meomen (High Tech Systems)

Initiative III:

Association Workforce Development Initiative

Initiative Mission:

To enhance capacity of IT associations to respond to the workforce development needs of the agribusiness cluster.

Initiative Overview:

This initiative will enhance the role of associations in responding to training / HR management needs of the sector. One of the outcomes of this program is to create and disseminate successful / best practice models for Egypt. Under the initiative, the four IT high tech associations will also form a joint HR committee.

Initiative Action Plan:

Step 1: The champions will meet to finalize objectives and work plan of the initiative. *(January 2000)*

Step 2: Four associations ESA, EHITA, ECA, and the EIS from the industry will form a joint HR development committee. *(February 15, 2000)*

Step 3: Create an on-line discussion group on HR development. *(February 15, 2000)*

Step 4: Create a clearinghouse to gather and disseminate information on: cluster training needs, HR management expertise, survey results, market trends, training providers, and specialized skills and service providers. *(August 2000)*

Initiative Champions:

Institutions: Egyptian Software Association (ESA), Egyptian High Tech Association (EHITA) Egyptian Computer Association (ECA) and the Egyptian Hardware Association (EHA), and the International Service Corps (IESC)

Individuals: Mohammed Abdel Fattah and Sayed Ismail

APPENDIX A: IT CLUSTER WORKSHOP PARTICIPANTS

Information Technology Cluster
Strategic Planning Workshop
Participant List
December 7, 1999

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Information Technology Cluster
Strategic Planning Workshop
Participant List
December 7, 1999

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